

Papillion-La-Vista South High School
Honors Algebra 2 Summer Packet

Students should work on the following skills to prepare for Honors Algebra 2. A pretest over these skills may be given the first week of school. Attach all work if using separate sheets of paper.

Linear Functions

To be a quadratic function, the highest exponent for x must be 1.

Slope-Intercept form of a linear function is $y = mx + b$.

Important skills for working with linear functions if identifying slope, y -intercept, and graphing.

Picture this: It's second semester Honors Algebra 2 and a big snowstorm is passing through the Metro area. The height of snow on the sidewalk can be modeled by the equation $y = 5 + \frac{2}{3}x$, where y is the height in inches, and x is the hours after midnight.

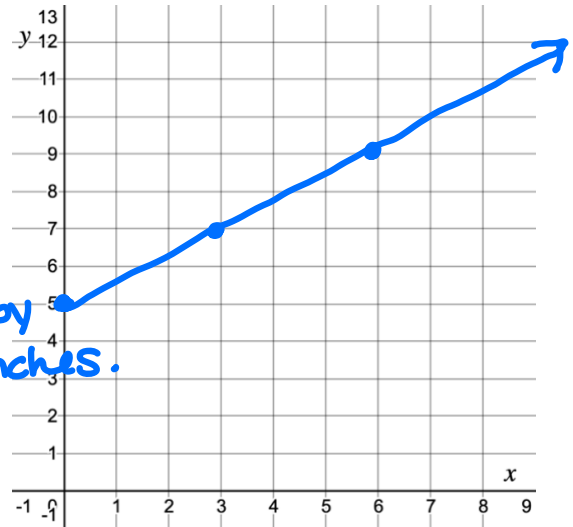
1. How many inches of snow are on the ground at midnight? How do you know?

5 inches → x is hours after midnight
 $x = 0$ is midnight so $y = 5 + \frac{2}{3}(0) = 5$ (y -int)

2. How many inches of snow are on the sidewalk at 3 AM?

$x = 3$ $y = 5 + \frac{2}{3}(3) = 5 + 2 = \mathbf{7 \text{ inches}}$

3. Graph the relationship between the height of snow and the time on the coordinate plan provided.



4. What is the slope of the line? What does this have to do with the snow on the sidewalk?

(OR)
 For each additional hour, the amount of snow increases by $\frac{2}{3}$ inch.

$\frac{2}{3}$ For each additional 3 hours after midnight, the height of snow on the sidewalk increases by 2 inches.

5. Where does this line cross the y -axis? What information does this tell you about the snow on the sidewalk?

(0, 5) This is the initial amount of snow on the sidewalk at midnight.

6. How many inches of snow are there on the ground at 4 AM?

$x = 4$ $y = 5 + \frac{2}{3}(4) = 5 + \frac{8}{3} = \mathbf{7\frac{2}{3} \text{ inches}}$

7. If there are 12 inches or more of snow on the ground at 6 AM, school will get canceled. Should you turn off your alarm? Explain.

$x = 6$ $y = 5 + \frac{2}{3}(6) = 5 + 4 = 9$ **No!** There will only be 9 inches of snow (it's a GO Day)

8. At what time will there be exactly 8 inches of snow on the ground?

$y = 8$ $8 = 5 + \frac{2}{3}x$

$\frac{3}{2} \cdot 3 = \frac{2}{3}x \cdot \frac{3}{2}$

$x = \frac{9}{2} = 4.5$ hrs after midnight
 There will be 8 inches of snow on the ground at 4:30 AM.

Quadratic Functions

To be a quadratic function, the highest exponent for x must be 2.

Standard form of a quadratic function is $y = ax^2 + bx + c$.

An important skill for working with quadratic functions is FACTORING and is explored in the activity below.

What's Missing?

For each of the following problems, find the missing pieces needed to make the equation true.

1.

a. $(x + 3)(x + 4) = \underline{x^2 + 7x + 12}$

b. $(x + \underline{2})(x + 7) = x^2 + 9x + 14$

c. $(x + \underline{1})(x + \underline{14}) = x^2 + 15x + 14$

d. $(x + \underline{1})(x + 5) = x^2 + 6x + \underline{5}$

e. $(x + 3)(\underline{x+6}) = x^2 + \underline{9x} + 18$

f. $(x - 4)(x + 7) = \underline{x^2 + 3x - 28}$

g. $(\underline{x-7})(\underline{x+4}) = x^2 - 3x - 28$

h. $(x + 6)(\underline{x-9}) = x^2 - \underline{3x} - 54$

i. $(\underline{x-6})(\underline{x-9}) = x^2 - 15x + 54$

j. $(x + 3)(x - 3) = \underline{x^2 - 9}$

k. $(\underline{x+8})(\underline{x-8}) = x^2 - 64$

l. $(x - 7)(x - 7) = \underline{x^2 - 14x + 49}$
 $(x-7)^2$

m. $(\underline{x+12})(\underline{x+12}) = x^2 + 24x + 144$
 $(x+12)^2$

n. $2(\underline{x+12})(\underline{x+12}) = \underline{2(x^2 + 24x + 144)}$
 $2x^2 + 48x + 288$

o. $\underline{3}(x + 2)(x + 3) = \underline{3(x^2 + 5x + 6)}$
 $3x^2 + 15x + 18$

Difference of
Perfect Squares
 $a^2 - b^2 = (a+b)(a-b)$

Perfect Square
Trinomials
(Factors are the same)

Factor out GCF
First

2. If the product (the right side) was missing, what strategies did you use?

Answers vary.

3. If the factors were missing, what strategies did you use?

Answers vary.

Factoring Practice

Factor each of the quadratics completely.

$$1. \quad x^2 + 7x + 10 = (x+2)(x+5)$$

$$2. \quad x^2 - 10x - 24 = (x-12)(x+2)$$

$$3. \quad x^2 - 81 = (x+9)(x-9)$$

$$4. \quad x^2 + 2x = x(x+2)$$

$$5. \quad 4x^2 - 48x + 108 = 4(x^2 - 12x + 27) \\ = 4(x-3)(x-9)$$

What's Missing? Part 2

For each of the following problems, find the missing pieces needed to make the equation true.

1.

a. $(x+3)(x+4) = x^2 + 7x + 12$

b. $(2x-1)(3x+4) = 6x^2 + 5x - 4$

c. $(2x+3)(x+4) = 2x^2 + 11x + 12$

d. $(x+6)(3x-2) = 3x^2 + 16x - 12$

e. $(3x+5)(x+1) = 3x^2 + 8x + 5$

f. $(x-3)(5x-6) = 5x^2 - 21x + 18$

g. $(2x+1)(2x+11) = 4x^2 + 24x + 11$

2. Compare these problems to the ones you did yesterday. What is different about them?

There is a number (coefficient)
for x^2 that is not equal to 1

3. How did you adjust your strategies to solve today's problems?

Answers vary.

4. If $(rx+s)(px+q) = ax^2 + bx + c$, what relationships can you find between the factors and the coefficients a , b , and c ?

First
term

$$\rightarrow r \cdot p = a$$

Last
term

$$\rightarrow s \cdot q = c$$

$$r \cdot q + s \cdot p = b$$

↑ ↑
outside + inside
└──────────┘
middle term

Factoring Part 2 Practice

Factor each of the quadratics completely.

$$1. \quad x^2 + 5x - 36 = (x + 9)(x - 4)$$

$$2. \quad 7x^2 + 15x + 2 = (7x + 1)(x + 2)$$

$$3. \quad -2x^2 + 4x + 70 = -2(x^2 - 2x - 35) \\ = -2(x - 7)(x + 5)$$

$$4. \quad 6x^2 + 11x - 10 = (3x - 2)(2x + 5)$$

$$5. \quad 6x^2 - 11x - 21 = (6x + 7)(x - 3)$$

$$6. \quad 4x^2 + 32x + 15 = (2x + 15)(2x + 1)$$

Resources

Linear Functions

[Intro to Slope-Intercept Form Video](#) & [Practice](#)

[Linear Equations Word Problems Video](#) & [Practice](#)

Quadratic Functions

[PLSHS Algebra 1 Flow Chart for Factoring Polynomials](#)

[Intro to Factors & Divisibility Video](#) & [Practice](#)

[Factoring Quadratics as \$\(x + a\)\(x + b\)\$ Video](#) & [Practice](#) & [Practice 2](#)

[Factoring Quadratics by Grouping \(trinomials when \$a \neq 1\$ \) Video](#) & [Practice](#)

[Difference of Perfect Squares Intro](#) & [Practice](#)

[Difference of Perfect Squares leading coefficient \$\neq 1\$ Video](#) & [Practice 2](#)

[Strategy in Factoring Quadratics in any form Video Part 1](#)

[Strategy in Factoring Quadratics in any form Video Part 2](#)

[Practice](#)